855,282 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

FIG.1.

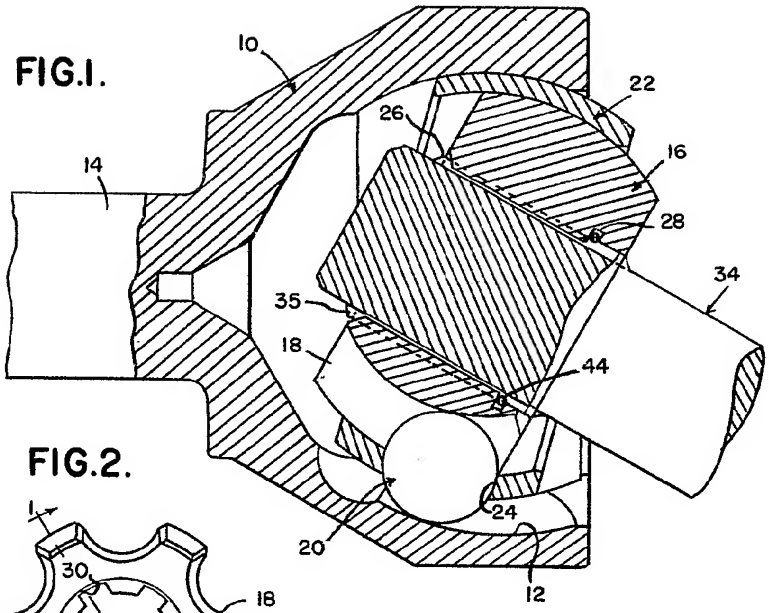


FIG.2.

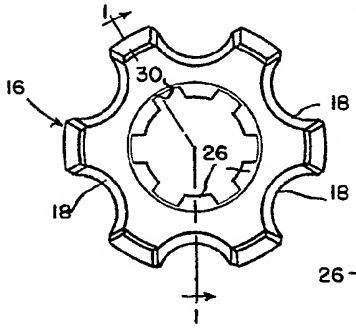


FIG.3.

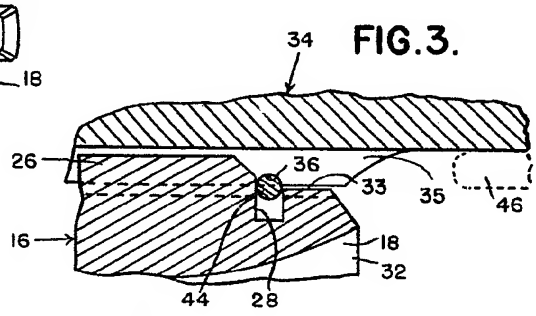
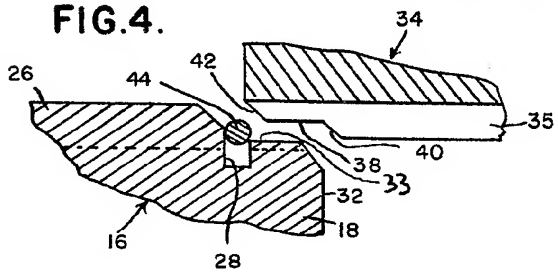


FIG.4.



PATENT SPECIFICATION

DRAWINGS ATTACHED

855,282

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International Classification: —F06d.

COMPLETE SPECIFICATION

Improvements in or relating to Structures Comprising a Shaft Received in a Recess in a Recessed Member

We, DANA CORPORATION, a corporation organized under the laws of the State of Virginia, United States of America, of 4100, Bennett Road, Toledo, Ohio, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to structures comprising a member having a recess and a shaft received in said recess, and particularly concerns universal joints having inner and outer ball races and adapted to transmit rotary motion between shafts.

According to the present invention there is provided a structure comprising: a member having a recess and a shaft member received in said recess; a circumferentially extending external groove in said shaft member and a circumferentially extending internal groove in said recess registering with said external groove; a flexible snap ring in one of said grooves and projecting partly into the other of said grooves to prevent relative axial movement between said members, said snap ring being adapted to be flexed from said one groove farther into said other groove and said other groove being of sufficient depth to accommodate said snap ring when thus flexed; and means providing an access opening in at least one of said members to said snap ring for the insertion of a tool to flex said snap ring as aforesaid.

For a better understanding of the present invention and to show how the same may be carried into effect reference will now be made to the accompanying drawings in which like designations indicate like parts and in which:—

Figure 1 is an elevational view, partly in section, of a constant velocity universal joint embodying the invention; the sectional portion taken substantially along the line 1—1 on Figure 2,

Figure 2 is an elevation of the inner race member,

Fig. 3 is an enlarged fragmentary view of a portion of Fig. 1; and

Fig. 4 is similar to Fig. 3 but shows the parts in another position.

Referring now more particularly to the drawing, the universal joint comprises a generally bell-shaped outer race member 10 formed with circumferentially spaced ball grooves 12 on its inner surface, only one of which can be seen in Fig. 1. A shaft 14 is formed integrally with the outer race member.

The universal joint also includes an annular inner race member 16 normally disposed within the outer race member and having the circumferentially spaced ball grooves 18 on its outer periphery which correspond to and approximately register with the grooves 12 in the outer race member. The number of grooves 18 is equal to the number of grooves 12, and a ball 20 is provided in each pair of registering grooves. An annular ring-like cage 22 is disposed within the outer race member and encircles the inner race member, having apertures 24 therein for receiving the balls.

Constant velocity is achieved by the ball groove geometry which maintains the driving balls and cage in a half angle position at all times. The groove construction compels the balls with the cage always to lie in a plane which bisects the angle between the driving and driven shaft no matter what the shaft angle may be. By maintaining the balls in the correct bisecting plane at all times, true constant velocity motion results.

The inner race member is formed with the internal splines 26 which extend from one end of the member to the other. The inner race member is formed with a circumferentially extending internal angular groove 28 which lies in a plane perpendicular to the axis of the inner race member, and the bottom of the groove has a greater radius than the radius of the recesses or grooves 30 between

the splines. The tops of the splines 26 are each substantially relieved from the groove 28 to the end 32 of the inner race member, as seen at 33 in Figs. 3 and 4.

The shaft 34 is received within the inner race member and is formed with external splines 35 adapted to extend into the recesses 30 separating the splines 26 of the inner race member to provide a non-rotatable connection therebetween. The splined portion of the shaft is formed with a circumferentially extending groove 36 which lies in a plane at right angles to the axis of the shaft. The depth of the groove is less than the radial height of the splines 35 so that the groove is really intermittent and formed by the segments in each spline which lie in continuation of one another. The radial height of the splines 35 is reduced at one end to provide a pilot diameter portion 38. The splines of the pilot diameter portion are connected into the main body portion thereof by the 30° taper 40. The splines of the pilot diameter portion 38 are also tapered at the front end 42.

A transversely split resilient snap ring 44 is provided to form a connection between the inner race member and the shaft.

In order to assemble the inner race member and shaft, the snap ring is inserted into the groove 28 of the inner race member as shown in Fig. 4. The snap ring is shown in Fig. 4 in its natural unstressed condition and extends only partly into the groove. The pilot diameter portion of the shaft is then inserted inside the snap ring, expanding it slightly. The shaft splines are then aligned with the inner race member splines and the shaft is pushed into the inner race member causing the snap ring to be further expanded by the 30° taper indicated at 40. The snap ring will ride over the major diameter portion of the shaft splines as the shaft is further inserted until the snap ring snaps into and seats in the snap ring groove 36 in the shaft. In this position, shown in Fig. 3, the snap ring projects partly into the groove 28 of the inner race member to retain the shaft securely within the inner race member against axial movement.

To disassemble, three or more disassembly pins 46, shown in dotted lines in Fig. 3, are inserted along the shaft between the splines thereof. The pins are each formed with a rounded end and are of a diameter substantially equal to the radial height of the shaft splines. The pins are adapted to extend within the snap ring and to expand it clear of or almost clear of the major diameter of the shaft splines. The groove 28 in the inner race member is of sufficient depth to receive the snap ring when it is thus expanded. The shaft may now be pulled from the inner race member.

WHAT WE CLAIM IS:—

1. A structure comprising; a member having a recess and a shaft member received in said recess; a circumferentially extending external groove in said shaft member and a circumferentially extending internal groove in said recess registering with said external groove; a flexible snap ring in one of said grooves and projecting partly into the other of said grooves to prevent relative axial movement between said members, said snap ring being adapted to be flexed from said one groove farther into said other groove and said other groove being of sufficient depth to accommodate said snap ring when thus flexed; and means providing an access opening in at least one of said members to said snap ring for the insertion of a tool to flex said snap ring as aforesaid.

2. A structure as claimed in Claim 1, and arranged as a universal joint having inner and outer ball races and adapted to transmit rotary motion between shafts, the recessed member forming an inner race member for the joint, wherein said inner race member is annular and has an internally splined portion, said shaft member having an externally splined portion engaging the splined portion of said inner race member to provide a non-rotatable connection between said members.

3. A structure as claimed in Claim 2, wherein said external groove is in the splined portion of the shaft member, and said internal groove is in the splined portion of said race member.

4. A structure as claimed in Claim 3, wherein certain of the splines of the splined portion of the inner race member are relieved from said internal groove to one end of the splined portion of said inner race member to provide access to said snap ring for the insertion of said tool.

5. A structure comprising a member having a recess and a shaft member received in said recess, substantially as hereinbefore described with reference to the accompanying drawing.

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